CAIT
Center for Advanced Infrastructure & Transportation
Rutgers, The State University of New Jersey

QUARTERLY PROGRESS REPORT

Project Title:	Concrete Shrinkage Analysis for Bridge Deck Concrete
RFP NUMBER: 2005-04	NJDOT RESEARCH PROJECT MANAGER: Anthony Chmiel
TASK ORDER NUMBER: TO 180 / RU Acct 4-26545	PRINCIPAL INVESTIGATOR: Dr. Husam Najm
Project Starting Date: 1/1/2006 **Original** Project Ending Date: 12/31/2006 **Modified Completion Date:**	Period Covered: 4th Quarter 2006

3	Identify all NJDOT mixes used in decks and those that exhibited cracking	7.0%	$ 10,000.00	25.0%	$ 2,500	70.0%	$ 7,000
4	Prepare mixes and perform AASHTO PP34-99 test on each mix	32.0%	$ 47,290.00	12.0%	$ 5,675	62.0%	$ 29,320
5	Prepare a list of cracking potential for each mix	3.0%	$ 4,500.00	10.0%	$ 450	30.0%	$ 1,350
6		0.0%	$ -	0.0%	$ -	0.0%	$ -
7		0.0%	$ -	0.0%	$ -	0.0%	$ -
8		0.0%	$ -	0.0%	$ -	0.0%	$ -
9		0.0%	$ -	0.0%	$ -	0.0%	$ -
10		0.0%	$ -	0.0%	$ -	0.0%	$ -
11		0.0%	$ -	0.0%	$ -	0.0%	$ -
12		0.0%	$ -	0.0%	$ -	0.0%	$ -
13		0.0%	$ -	0.0%	$ -	0.0%	$ -
14		0.0%	$ -	0.0%	$ -	0.0%	$ -
15		0.0%	$ -	0.0%	$ -	0.0%	$ -
16		0.0%	$ -	0.0%	$ -	0.0%	$ -
17		0.0%	$ -	0.0%	$ -	0.0%	$ -
18		0.0%	$ -	0.0%	$ -	0.0%	$ -
19		0.0%	$ -	0.0%	$ -	0.0%	$ -
20	Final Report and Quarterly Reporting	39.0%	$ 58,906.00	12.0%	$ 7,069	42.0%	$ 24,741
	TOTAL	100.0%	$ 148,696		$ 16,974		$ 86,090

Blue text is entered once at the beginning of the project

Green text is updated ever quarter

Black text is automatically updated or static

Project Objectives:

The objectives of this study are to: 1) Evaluate the shrinkage potential properties of concrete mixes which are currently being used for bridge deck applications in New Jersey using the AASHTO PP 34-99 test method and 2) Provide a list of all tested mixes from the lowest cracking potential to the highest.

Project Abstract:

For many years, scientists and engineers have been improving on the development of concrete technology. Concrete is no longer a simple material that only includes cement, water, and aggregates but a more involved mixture. Many pozzolanic materials (such as silica fume, and fly ash) and chemical admixtures (such as superplasticizers and air entraining agent) are being added to improve the quality of the concrete. However, there is a concern the compressive strength no longer constitutes the only criterion in specifying the concrete, but other factors, such as shrinkage and durability, become more pronounced. HPC has been developed to highlight the durability of concrete. Technical specifications have been developed to ensure the best performance of High Performance Concrete (HPC). However, it has been observed by State Engineers that many bridge decks are exhibiting cracking soon after being poured. A test has been developed by AASHTO (PP 34-99, The Passive or Restrained Ring Test) that measures the cracking potential of a concrete mix. This cracking tendency test needs to be performed on all NJDOT current and experimental mixes used for bridge decks to identify those mixes that exhibit high cracking tendencies.

1. Progress this quarter by task:

Total of 11 mixes have been completed.
• 5 mixes remain. Confirmation of 2 of these mixes was needed and it was received on 11/08/2006. Materials for the remaining 3 mixes were received 11/30/2006.
• Effect of curing is being tested for one of the mixes (as discussed in the previous quarterly meeting). For this mix, 4 rings have been cast and they are still under observation
• Due to the current setup of the test, no cracks were observed in 56-day period. Testing period has been extended to 91 day of visual and graphical observation of the rings for cracking.

2. Proposed activities for next quarter by task:

The remaining 5 mixes are planned to be mixed within the month of December. •
• Data on the remaining mixes will be collected and finalized.
• Performance of the mixes will be compared according to their cementitious content and w/c ratio (as discussed in the previous quarterly meeting).
• Potential of shrinkage will be defined and all mixes will be rated in terms of performance according to their respective potentials.

• Free shrinkage and restrained shrinkage results will be compared to suggest a limit value for free shrinkage to minimize the potential for restrained shrinkage cracking

3. List of deliverables provided in this quarter by task (product date):

- **List of the 16 mixes already complied from NJDOT.**
- **Results from 56 days and 91 days with visual observations and graphical results. of shrinkage tests and other tests already performed on the complied mixes.**

4. Progress on Implementation and Training Activities:

5. Problems/Proposed Solutions:

Total Project Budget	$148,696
Modified Contract Amount:	
Total Project Expenditure to date	$86,090
% of Total Project Budget Expended	57.9 %

NJDOT Research Project Manager Concurrence: _____ Date: _____